AIR WAR COLLEGE

RESEARCH REPORT

MULTIPLE LAUNCH ROCKET SYSTEM
AN AMMUNITION RESUPPLY CHALLENGE

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1988

AIR UNIVERSITY
UNITED STATES AIR FORCE
MAXWELL AIR FORCE BASE, ALABAMA

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MULTIPLE LAUNCH ROCKET SYSTEM
An Ammunition Resupply Challenge

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A RESEARCH REPORT SUBMITTED TO THE FACULTY

IN

FULFILLMENT OF THE RESEARCH

REQUIREMENT

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MAXWELL AIR FORCE BASE, ALABAMA

April 1988

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AIR WAR COLLEGE RESEARCH REPORT ABSTRACT

TITLE: Multiple Launch Rocket System an Ammunition Resupply Challenge

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A look at one of the most modern battlefield weapons system, and the impact of it on the doctrinal ammunition supply procedures. An analysis of the current and emerging ammunition resupply doctrine is presented based on a divisional defensive model. The excursion combines Soviet and US Army warfighting doctrines to develop realistic expenditure rates and resupply requirements. The authors provide the decision maker with some recommendations to fully test and improve the current, as well as, the emerging doctrines to support the AirLand battlefield with ammunition.

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LTC Burns graduated from Ohio University with a Bachelor of Arts in History in 1967. He received his Regular Army Commission through ROTC where he was selected the Distinguished Military Graduate. He earned a Master of Arts from Webster University in 1984. He attended the Field Artillery Officer Basic and Advanced Courses, and the Command and General Staff College. He held various command and staff positions in Field Artillery units in CONUS, Korea, Vietnam, West Berlin and the Federal Republic of Germany. As a Field Grade Officer he was assigned to C3, US/ROK Combined Forces Command, Seoul Korea, followed by troop assignments at FT Sill, Oklahoma where he served as the Executive Officer, 2d Battalion, 34th Field Artillery, and S-3 and Executive Officer, 75th Field Artillery Brigade. In 1984, he was selected to command the 1st Battalion, 17th Field Artillery. He is a graduate of the Air War College, Class of 1988.

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CHAPTER I

INTRODUCTION

"War is a matter of vital importance to the State; the province of life or death; the road to survival or ruin. It is mandatory that it be thoroughly studied."

Sun Tzu

The Field Artillery is the "King of Battle". History has proven that more death and destruction has, in previous wars, been inflicted on the enemy by various types of artillery fire than any other U.S. Army system. Without artillery fire delivered accurately, on time and in sufficient quantities to stop an advancing enemy, there is little chance of winning the next war. The Multiple Launch Rocket System (MLRS) has recently been added to the artillery inventory as part of the Army's modernization program. This new system provides a quantum increase in firepower. Because of this increase of in firepower an enormous burden has been placed on the supply sytem to provide the tremendous quantities of ammunition consumed by this weapon. Although the MLRS is a significant combat multiplier and provides fire support never experienced before, it appears that the support systems required to sustain its operation were not adequately considered during its development. The increased requirements for ammunition seemed to be superimposed on an

already overtaxed system. This study will attempt to show that the current ammunition resupply system is not capable in its present configuration to absorb the additional requirements placed on it by the MLRS.

The paper is broken down into 5 chapters, including this brief introduction. Chapter II descibes the multiple launch rocket system and its importance on the battlefield. Chapter III briefly describes the US and Soviet doctrine on battlefield operations for maneuver and fire support. It further establishes the base scenerio for the ammunition supply requirements. Chapter IV describes current and emerging ammunition supply doctrine. The final chapter is the collective analysis by the authors to identify supportability of the MLRS, shortfalls and recommendations.

An analytical study is important for any war fighter to undertake. It enables him to wargame all aspects of future conflicts. The campaign and tactical analysis is the easiest and the most glamorous undertaking. The true war fighter knows that his plan is only as good as the weakest link. The weakest link and most overlooked aspect is normally logistics. A weapons system is only useful if it is properly manned and the established procedures enable it to be resupplied.

CHAPTER II

The MULTIPLE LAUNCH ROCKET SYSTEM (MLRS)

2.1 General

The multiple launch rocket system is a non-nuclear surface to surface, free-flight rocket system. It is designed to complement cannon field artillery, as well as supplement other fire support systems by engaging high density mechanized targets during peak periods. The MLRS battalion is assigned to corps and may be further attached to a field artillery (FA) brigade or division(s) within the corps. A separate MLRS battery is organic to Mechanized Infantry and Armored divisions. (1:1-1)

MLRS operations are characterized by dispersion of launchers using its mobility to the maximum. The system consists of the self propelled launcher, launch pod/containers (LP/C), ammunition resupply vehicles, and a command, control and communications system (C3). (1:1-1)

Each launcher has the on-board capability to receive a fire mission, determine launcher location, compute technical firing data, orient on the target, and fire up to 12 rockets per mission. All 12 rockets can be expended in less than 60 seconds and can be fired at the same or individual targets. Maximum range for the rocket is over 30 kilometers. Six rockets are factory loaded in a LP/C. (1:1-2)

Ammunition resupply capability for MLRS is provided by the heavy expanded mobility truck (HEMTT) M985 and the heavy expanded mobility ammunition trailer (HEMAT) M989. Each can carry four launch pod/containers for a total of 48 rockets in a HEMTT/HEMAT load. There are 54 such ammunition carriers in a battalion or 18 per firing battery. (1:1-2)

Tactical and technical command and control of the MLRS units are accomplished by established field artillery C3 systems. The MLRS C3 is designed to be integrated with the computerized tactical fire direction system (TACFIRE) to optimize system employment and effectiveness. This computer interface capability extends throughout the MLRS battalion down to the individual launcher level. This system can communicate digitally or verbally with any compatible remote device, computer, Q36/Q37 (counterbattery/mortar) radar, or launcher in a secure mode or with any system in an unsecure mode. (1:1-3)

2.2 Munitions

The MLRS uses a tube launched, spin-stabilized, free flight M26 tactical rocket. The rocket is 3.94 meters long, 227mm in diameter and weighs 307 kilograms. Propulsion for the rocket is provided by a solid propellant rocket motor. The warhead section contains 644 separate M77 submunitions designed to detonate on impact with effects against both personnel and lightly armored materiel. (1:1-09)

As mentioned previously an LP/C consists of six

individual launch and storage tubes for MLRS rockets mounted in an aluminum frame. Two LP/Cs make up one launcher's maximum load. These launch pod/containers are 4.04 meters (13 feet 3 inches) long and 1.05 meters (3 feet 5 inches) wide. The height of the container is 0.84 meter (2 feet 8 inches) with skids and 0.72 meter (2 feet 5 inches) without skids. When loaded, the container weighs 2,270 kilograms (5010 pounds). The LP/C can only be stacked two high during transportation and four high during storage. (1:1-11)

The U.S. Army is constantly working to achieve better effects and provide more capability to meet the demands of a modern battlefield. MLRS munitions currently under development are as follows:

a. Binary Chemical Warhead (BCW)
b. Terminal Guided Warhead (TGW)
c. Search and Destroy Armor Warhead (SADARM)
d. Army Tactical Missile System Warhead (ATACMS)
e. AT2 Antitank Mine Warhead (AT2)

The addition of such munitions will increase the lethality of the battlefield. (1:1-13)

2.3 Concepts of Employment

On the modern battlefield the corps commander's area of influence includes the enemy units that are within 72-96 hours of the forward line of troops (FLOT). The corps commander must be able to identify critical targets as they enter his area of influence. The MLRS provides the commander

with the inherent mobility to position well forward and to easily mass a tremendous amount of firepower. These two capabilities permit the commander to extend his influence and attack targets previously beyond the range of his conventional cannon systems. Figure 2-1 shows an effects comparision of MLRS in terms of equivalent of cannon artillery. (1:4-1)

MLRS battalions are normally attached to each field artillery brigade. The brigades are assigned a mission in support of each committed division or in support of the corps. Therefore the MLRS battalion will have a dramatic impact on the battlefield. The battalion can be treated as a division artillery or field artillery brigade in terms of firepower. It consists of a headquarters and service battery and three identical firing batteries consisting of 9 self propelled rocket launchers, 18 - ten ton HEMTT/HEMAT ammunition vehicles, and associated C3 and support equipment. The battalion has the capability to carry 2916 rockets containing nearly two million submunitions. The MLRS battalion requires as much terrain as 3 direct support (DS) cannon battalions to adequately deploy and survive. Putting this potential at the proper place and time is the force commander's responsibility. He establishes the command relationships and assigns tactical missions. (1:5-1)

The command relationships available are the normal four used throughout the military services. They are:

EFFECTS COMPARISON

DUAL PURPOSE IMPROVED CONVENTIONAL MUNITIONS

(DPICM)

MLRS		155mm Howitzer
30KM	Range	17.5KM
644 Submunitions	1RKT/1RD	88 Submunitions
1 Rocket	Equals	7.32 Rounds
1 Launcher load (12 Rockets)	Equals	3.6 Battalion Volleys* (88RDS)
1 Battery-9 Launchers (108 Rockets)	Equals	33 Battalion Volleys* (792 RDS)

* 24 Howitzer Battalion

Figure 2-1. EFFECTS COMPARISON

a. Organic units are those shown on the Table of Organization and Equipment, of the division or corps.

b. Assigned units are placed in a unit on a rather permanent basis for the purpose of strategically tailoring the force.

c. Attached units are placed temporarily in an organization. It is treated as an organic unit in all administrative, logistical and control matters.

d. Operational Control has the same control as attachment, but without responsibility for administration or logistics support. This is a status normally established between maneuver units. It is not an appropriate status for a maneuver headquarters and FA unit.(2:11)

After the selection of a command relationship the commander must assign a field artillery tactical mission. The assignment of a tactical mission establishes the inherent responsibilities (see fig.2-2) the battalion will be required to perform. The MLRS battalion is not equipped for the Direct Support mission and cannot perform its requirements. It can only perform the remaining three field artillery missions. Reinforcing (R) - It is a tactical mission that causes one field artillery battalion to augment another field artillery battalion's fires. It is a highly decentralized mission. (2:11) It gives the reinforced unit the responsibility to position and completely control the fires of the battalion. The mission removes the battalion from immediate control of the force field artillery commander.

General Support Reinforcing (GSR) - The GSR mission requires the field artillery to furnish artillery fires for the force as a whole and to reinforce the fires of another

field artillery battalion as a second priority.(2:11) This is a flexible mission maximizing use of fire support assets by establishing a quick fire channel to respond to requests for fire from the reinforced unit and concurrently providing fire support to the force as a whole. No other mission allows for this responsive fire support and control.

General Support (GS) - A battalion assigned the mission of GS supports the force as a whole and is under the immediate control of the force commander. It is the most centralized mission of the four standard tactical missions. Because of the direct control exercised by the force artillery commander, centralization occurs at the highest levels for positioning and fire planning unlike the DS mission where such responsibilities lie with the battalion commander.(2:2-12)

The MLRS will be employed consistent with the mission requirements, normally more centralization during defensive operations and decentralized during offensive operations. Whatever the scenerio the MLRS will typically use "shoot and scoot" tactics and will be spread throughout the battlefield. These characteristics of employment compound the already complicated command and control system, because of the distances involved and the fluidity of the battlefield. The combat service support problems are exponentially compounded based on the almost autonomous nature of launcher operations. This self sufficient organization still requires

external support and will rely on a delicate balance of internal assets and external support to ensure the full combat capability of a MLRS battalion can be brought to bear on the enemy.

A FA UNIT WITH A MISSION OF --	REINFORCING (R)	GENERAL SUPPORT REINFORCING (GSR)	GENERAL SUPPORT (GS)
ANSWERS CALLS FOR FIRE IN PRIORITY FROM--	1. Reinforced FA HQ 2. Own Obs 3. Force FA HQ	1. Force FA HQ 2. Reinforced Unit 3. Own Obs	1. Force FA HQ 2. Own Obs
HAS AS ITS ZONE OF FIRE --	Zone of fire of reinforced FA unit	Zone of action of supported unit to include zone of fire of reinforced FA unit	Zone action of supported unit
FURNISHES FIRE SUPPORT TEAM (FIST/FSO)	No req	No req	No req
FURNISHES LIAISON OFFICER--	To reinforced FA unit HQ	To reinforced FA unit HQ	No req
ESTABLISHES COMMUNICATIONS WITH--	Reinforced FA unit HQ	Reinforced FA unit HQ	Force FA HQ
IS POSITIONED BY--	Reinforced FA unit or as ordered by force FA HQ	Force FA HQ or reinforced FA unit if approved by force FA HQ	Force FA HQ
HAS ITS FIRES PLANNED BY--	Reinforced FA unit HQ	Force FA HQ	Force FA HQ
ESTABLISHES MUTUAL SUPPORT WITH --	Reinforced unit or as specified by force FA HQ	Reinforced unit or as specified by force FA HQ	FA unit specified by force FA HQ
HAS ITS COMMANDER's CRITERIA est by-	Reinforced FA unit	Force FA HQ	Force FA HQ

Figure 2-2. Inherent Responsibilities of MLRS Missions

CHAPTER III

THE MID-INTENSITY BATTLEFIELD

3.1 General

This chapter will address the US and Soviet operations in a mid-intensity battlefield in central Europe, and focus on a divisional slice of a US Corps. It will also establish the basic combat parameters used in the study of ammunition resupply for a MLRS battalion.

3.2 Soviet Operations

The Soviet Union considers the offense to be the basic form of military operations. In the offense, following closely the concepts of mass, momentum, and continuous operations, Soviet tactics focus clearly on concentration of numerically superior forces and firepower for a combination of frontal attacks, envelopments, holding attacks and deep thrusts to the enemy's rear by armor heavy combined forces. It is believed that offensive momentum must be built up and maintained. This momentum is sustained by echelonment of forces in depth so that succeeding echelons can pass through or around the first echelon, join the fight with fresh forces, and press on to achieve and maintain continuous operations. (3:47-48)

Echelonment of forces is an important concept during both offensive and defensive operations. Each commander down

to battalion level determines the number of echelons required for an operation. Commanders are also permitted to retain a reserve force. They use them as their contingency force. Missions for this reserve force are replacement for destroyed units, repel counterattacks, provide local security against heliborne/airborne and partisan operations, and as an exploitation force to influence the outcome. (3:48)

Operational maneuver groups (OMG) may be formed at theater of military operations through army level with the primary mission of supporting the main attack by disrupting and causing as much destruction in the enemy's rear as possible. At army level an OMG may be as large as a reinforced division and at front level it may be as large as an army. The OMG can be committed at any time the commander feels is appropriate. It has a definite geographical object and must ensure it does not become decisively engaged prior to attainment of its primary objective. (3:49)

In the attack the Soviets attempt to overwhelm the defense with weight and speed of his attack both day and night. The attack is conducted on a broad front, with formations moving on independent axes. Main attack ratios, known as norms, are armor 1:3-6, artillery 1:6-8, and motorized infantry 1:4-5. (3:56) Such ratios can ensure a greater chance for success and supports the Soviet concept of warfighting. Figure 3-1 shows a comparison of US and Soviet divisions.

	TANK/ARMORED		MOTOR/MECH	
	USSR	US	USSR	US
PERSONNEL	12k	17k	13k	18k
No. Regt/BDE	4	3	4	3
No. BN	17	16	18	16
EQUIPMENT				
Med Tank	322	360	265	288
APC	243	180	451	216
ARTY	90	112	108	112
ATGM	9	480	51	534

Note 1 Soviet personnel figures are approximately 25% smaller than US because of the lack of organic logistical personnel.

Note 2 Soviet artillery figures are smaller than US but have a larger nondivisional pool to draw from for operations.

Note 3 All data extracted from US Army War College Reference Text Soviet Armed Forces, 1986, p99.

Figure 3-1 US--Soviet Divisions

The efforts of the other arms are to support the ground war to its fullest. The Soviet doctrine epitomizes a true combined arms team under one commander. This is a major difference from current US doctrine, with its parochial component commander system of warfighting. The Soviet military is a formidable enemy who demands our respect. We must continually refine doctrine, develop quality equipment and train combat ready soldiers to be able to defeat the Soviets in any future combat.

3.3 US Operations

The Corps is the largest tactical unit within the US Army. It is composed of divisions of any type and nondivisional units such as an Armored Cavalry Regiment, numerous Field Artillery Brigades and the requisite combat sevice support to sustain itself on the battlefield. (4:185)

The Division is the largest US Army organization that trains and fights as a team.(4:185) On its battalions lies the outcome of battle. A division is organized with varying types of combat, combat support, and combat service support units. It fights as a combat arms team, forming task forces with its combat units. The normal size of a division's defensive area of operation is approximately 40km wide and 60km deep. The size will vary based on the situation, terrain and mission, however, when the area becomes to large the requisite weapons density for a credible defense is lost without the attachment of additional forces.

The US Army's AirLand Battle is the doctrine that will be employed in any future conflict. The doctrine basically views the battlefield from three dimensions and with three simultaneous battles. The deep battle will be used to control the flow into the close battle area and to establish offensive operations. The rear battle is used to ensure the sustainment of the fighting force in the close battle, while the close battle is where the defeat of the Soviet forces will take place. (4:36-40) This doctrine establishes the nonlinear nature of all future battles, and the requirement for each commander to understand his superior's intent. He must further understand how each of the three operations interrelate and impact on the entire campaign.

Unlike previous doctrine, AirLand Battle doctrine addresses the whole area of operations. It attempts to deal with all Soviet capabilities, countering their strengths and exploiting their vulnerabilities. It stresses a combined arms approach, using the technology and lethality of our military services' equipment and superior military personnel to offset the Soviet numerical superiority.

The battlefield will be characterized by a highly mobile nonlinear environment, which will have offensive and defensive operations being conducted simultaneously in the air and on the ground. The defense will be characterized by prepared positions, with concentrations of forces on the most

likely avenues of approach. Concurrently, the offensive actions undertaken must be violent, audacious and totally unpredictable to gain the initative or to slow the enemy from overwhelming the defense. The air campaign will complement both the offensive and defensive nature of the battle with battlefield air interdiction and close air support. Both operations must capitalize on the speed and qualitative edge in equipment of the US Forces.(4:95,131) In light of the dynamics of such fighting, the commander must ensure his intent is understood by all commanders for complete success, thus enabling subordinates to continue with the battle during periods of greatest fog and friction of warfighting.

3.4 Operational Scenerio

The basic setting for this study is an armored division. It faces an attacking combined arms army supported by air and artillery from front assets. The army is attacking with two divisions in the first echelon and two divisions in the second echelon.

Each of the first echelon division leads with a tank heavy advance guard. Its purpose is to locate the main battle area. The advance guard is normally a reinforced battalion from the first echelon regiments.

The US division will deploy a covering force to its front to deceive the Soviets into believing it is the main battle area. It is normally one of the division's brigades augmented with cavalry assets, field artillery, air

defense artillery, and combat engineers. The covering forces' other primary mission is to ascertain the main attack area without getting decisively engaged.

When contact is made, the Soviet advance guard attempts to destroy the covering force. If not successful, it attempts to locate weak points, gaps and flanks. The main body of the first echelon regiments of the first echelon divisions attacks from the march and conducts a hasty attack.

The covering force will delay the Soviet force with offensive and defensive action, each action attempting to slow the advance and to make them deploy by deceiving them into thinking they are in the main battle area. The covering force is basically trading space for time. It is imperative that the full spectrum of fire support be employed to support the light covering force to disrupt the Soviet plans and timing.

Once the division commander has determined where he intends to employ his force, he designates battle areas in which the brigade commanders are expected to fight. The brigade commanders and their respective battalion commanders decide how to defend their battle areas. It may be an area or mobile defense which ever best meets the situation and facilitates future offensive operations. The plan will incorporate all available combat power and fire support assets.

After the handoff of the battle to the main battle area it becomes an orchestration of offensive and defensive operations to slow, disrupt and defeat the enemy. The violent application of direct and indirect fires in conjunction with maneuver from flanks and rear all compose the battle.

The rear battle will be joined concurrently either through a by-pass, infiltration or vertical envelopment. This poses the most difficult threat to counter. Forces are committed to the main battle area. These forces for rear operations must be diverted from their primary mission in the main battle area and moved rearward to the fight. The time involved and relative lack of fire power available to the units located in the rear make them primary targets. Additionally, attacks in the rear detract from the combat service support units' (CSS) primary mission in combat. CSS units,when engaged by the enemy, can no longer provide support of any kind to the combat brigades. Upon attack on the division or corps rear, all units become involved in defensive combat operations. This becomes a combat detractor of the highest order.

The nondivision MLRS battalion was given a mission of general support to the division artillery. It was deployed throughout the division area. It began the battle during covering force operations far forward. The division's battery was deployed ahead the forward edge of the

battle area (FEBA) to assist in the deep interdiction of the advancing Soviets. The firing platoons of the battery were deployed approximately 15km apart accross the zone. As the counterbattery threat increased, the battery was withdrawn to 4km to 10km behind the forward edge of the battle area (FEBA) and was used in a counterbattery role and to engage high value soft targets based on a target value analysis.

This setting will be used to develop the ammunition requirements for this investigative excursion in combat service support.

CHAPTER IV

AMMUNITION SUPPLY DOCTRINE

4.1 General

In order to examine the current doctrinal system for the resupply of ammunition to the MLRS units in a theater of operations, we must look at how the resupply system is designed, what units are assigned, and the capabilities of these units. If you take the standard theater area (Figure 4-1) you will see the battlefield divided into brigades, division, corps and theater areas of responsibility. The theater rear area, is the point at which ammunition arrives from the continental United States or from wherever the ammunition may be obtained. From there the ammunition moves forward until it is issued to the user. The majority of ammunition will arrive by containership with selected critical items arriving by air.

Ammunition supply in the theater is based on continuous refill. This means that stocks issued to users are replaced by stocks moved up from the rear area. Ammunition stockage levels at rear storage areas are sustained by deliveries from CONUS or other designated sources. (5:34)

4.2 Theater Operations

Ammunition is shipped to the theater by containership or breakbulk transport. Containerships generally transport ammunition that is packed in sealand containers with each

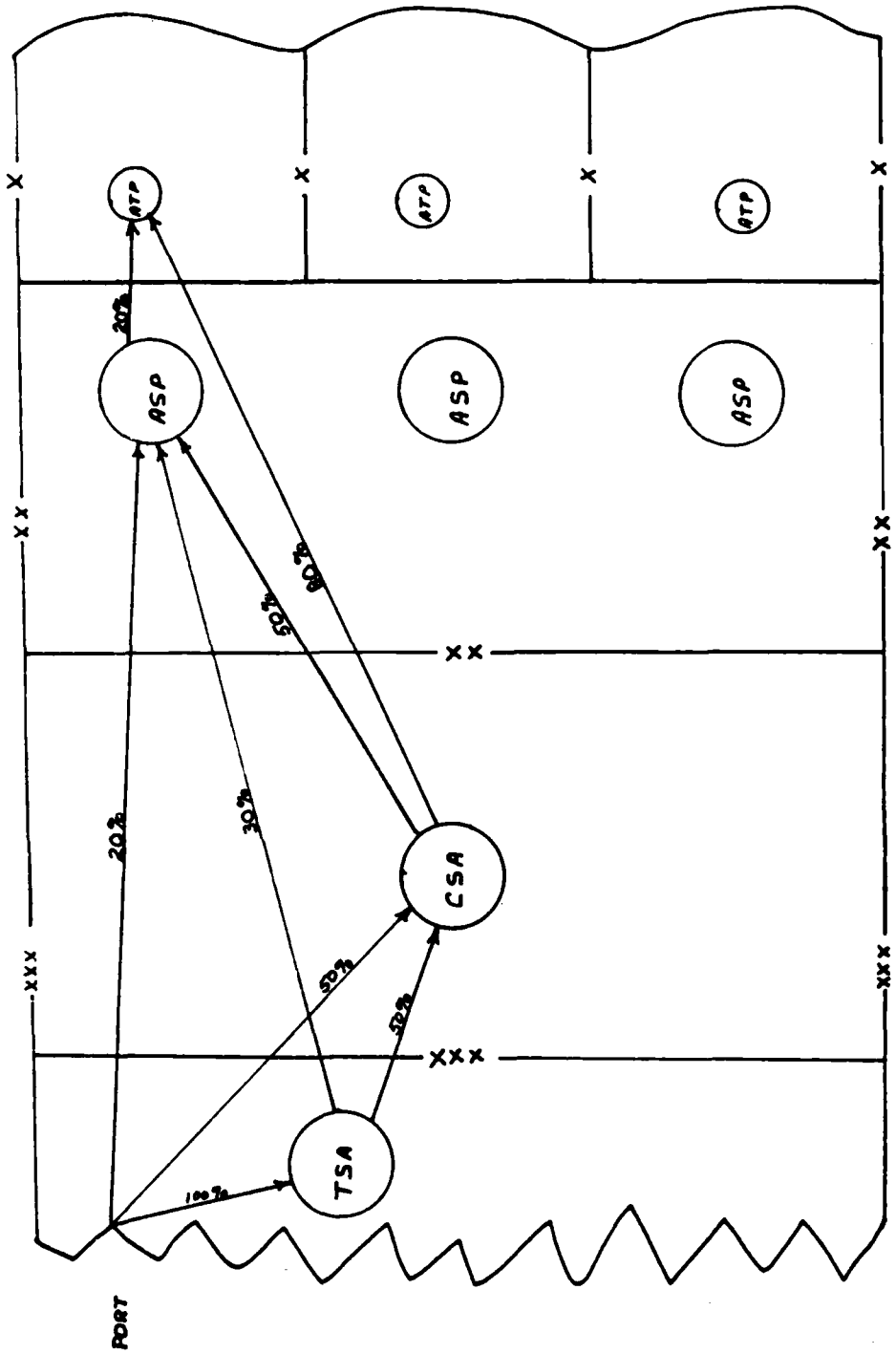

Figure 4-1. Standard Theater Area

container filled with one specific type of ammunition. Breakbulk is the term given to a shipment of ammunition that contains several different types of ammunition not necessarily categorized. Selected items, critically needed to fill existing shortages, may be shipped by air. This is not the preferred mode of shipment and occurs only when the theater commander feels that the outcome of a significant battle requires delivery by the fastest means. Upon arrival in the theater, ammunition is moved through fixed ports. The port facility is operated by a Terminal Transfer Company. This unit will offload the ammunition rapidly and will move it to the staging area where theater transportation assets take it forward. Once ammunition clears the port area, the bulk of it is routed by rail or truck to theater and corps storage areas (CSA). Some ammunition may be throughput directly to ammunition supply points (ASP) in or near the combat division rear.(5:34)

Theater Storage Areas (TSA), are located within the theater area. Ammunition is generally shipped from the seaport or airport on theater transportation (line haul trailers, rail, inland waterways, and aircraft) to the TSA. Depending on the supply situation in the forward areas, it could be shipped even further forward toward the battle area. The TSA performs receipt, accountability, storage, maintenance and issue of ammunition. The number of TSAs in a theater (normally two or more) is dependent on theater

stockage levels.(6:3) The TSA ships ammunition to the Corps Storage Areas (CSA) and the Ammunition Supply Points (ASP).

An Ordnance Ammunition General Support Company operates the TSA. At full strength, this unit can provide the following:(5:30)

a. A daily lift capability of 3,700 short tons. During the period, D to D+15, this lift is assumed to be 50 percent receipts and 50 percent issues. For the period D+15 to D+60, the capability is one-third each for receipts, issues and rewarehousing.

b. Direct support maintenance and limited modification of conventional ammunitions, components and containers.

c. Emergency destruction of unserviceable ammunition.

4.3 Corps Operations

Ammunition resupply within the corps area is provided by the corps storage areas (CSA) and the ammunition supply points (ASP). CSAs encompass those facilities established across the corps rear to support division combat forces. Based on current doctrine and projected rates, a sizeable tonnage of ammunition will be stockpiled behind each division. At least one CSA will be behind each division to support ASP and ATP operations. (6:36) The number of CSAs in the corps depends on the quantity of ammunition required to support the tactical situation and the corps stockage level. The CSA receives ammunition from the port and TSA and

performs receipt, accountability, storage, maintenance and issue to the ASPs and the Ammunition Transfer Points (ATP).(5:3) Initial stockage in the CSA will be 100 percent breakbulk from prepositioned war reserves. Replenishment stocks from CONUS will be a mix of containers and breakbulk.(6:36)

The CSA will supply 50 percent of the ASPs requirements and 80 percent of the ATPs requirements for ammunition. The supplies will be delivered in breakbulk form. The CSAs also issue to units operating in the corps rear on an area support basis with units picking up required or allocated ammunition at the CSA. The distance between the CSA and the ASP should not be more than 100km. There should be no more than 130km between the CSA and the ATP. These distances are near the maximum practical linehaul distance of a medium truck company.(6:36) Like the TSA, the CSA is also operated by an Ordnance Ammunition General Support Company, which is part of the Corps Support Command (COSCOM).

From the TSA and CSAs, ammunition is shipped to an Ammunition Supply Point. The ASP is the primary source of conventional ammunition for the division sector. ASP stockage levels are dependent on tactical plans, available ammunition and vulnerability of lines of communication to attacks (air and ground), thereby disrupting shipments from TSAs and CSAs to the ASP. Normally 3 to 5 day stockage is planned, but the requirements for flexibility and rapid

relocation may limit the stocks on the ground to a 2 day supply. However, in a stable situation or in preparation for an offensive, the stockage level may be increased to 4 or 5 days of supply. The location of the ASP stocks will be as far forward as possible, generally near the division rear boundary, thus providing the shortest turn around time for combat units.(6:37) ASP shipments to the ATPs consist of 90 percent high tonnage, high consumption items and 10 percent low consumption and low tonnage items. The ASPs also provide support to units operating in close proximity to them on an area basis with units picking up required/allocated ammunition at the ASP.(5:3)

ASPs are operated by the Ordnance Direct Support Ammunition Company. This unit at full strength provides: (6:29-31)

a. The capability of operating one ASP on a sustained basis and when properly augmented, two ASPs.

b. A daily lift capability of 2,200 short tons of breakbulk and 1,850 short tons when stocks are an equal mix of 50 percent containers and 50 percent breakbulk.

c. Direct support maintenance and limited modification of conventional ammunition, components and containers.

d. Emergency destruction of unserviceable ammunition.

4.4 Division Operations

An ATP will be established in each brigade trains area

under the physical control of the Supply and Service (S&S) Company of the Forward Support Battalion. As an element of the support battalion, the ATP is established in the brigade trains area in order to reduce the travel time of user supply vehicles. The fourth ATP is located in the Division Support Area (DSA) and is operated by the Ammunition Section of the S&S Company of the Main Support Battalion (MSB). The ATPs primarily handle high usage, high tonnage items such as artillery including MLRS rockets, tank main gun, attack helicopter and engineer munitions.(6:38)

Ammunition will be shipped to the ATPs on line haul trailers where they will be disconnected from the prime mover and left fully loaded. The prime mover will hook up to an empty trailer at the ATP and return to either the CSA or ASP to begin the operation over again. Keeping the ammunition uploaded removes the requirement for the ATP section to download the ammunition only to handle it again when a unit comes to resupply. Remaining uploaded also aids the units when the enemy situation changes to the point that the ammunition must be moved on short notice.

The division commander will specify which units will be supported by each ATP. He also has the responsibility to determine the quantity and mix of munitions. The division ammunition office (DAO) will coordinate ATP operations with corps and divisional units. Ammunition is transferred from semitrailers to user tactical cargo vehicles by forklifts,

cranes and material handling equipment (MHE) onboard user ammunition resupply vehicles. These resupply vehicles move ammunition forward to the field and combat trains or weapon system rearm points. MLRS ammunition for divisional and corps units is handled in the same manner, however, it will be delivered to the designated ATPs which will support the MLRS units during a particular phase of the battle. From there the rocket pods will be transloaded from corps to user vehicles by MHE onboard user ammunition resupply vehicles.(5:4)

The ammunition sections of the MSB and FSBs have very little capability when compared with the Ordnance Ammunition Company. The section is divided into two teams, one for each 12 hour shift. The ATP team from the MSB has rough terrain forklifts, rough terrain cranes with operators, a noncommissioned officer (NCO) and a representative from the DAO. The teams from the FSBs have the same capability with the exception of the rough terrain cranes. The team's primary mission is to transload ammunition from corps stake and platform (S&P) semitrailers to user resupply vehicles. The projected rated capability of each ATP is 500 short tons a day.(7:5-7)

4.5 MLRS Ammunition Responsibilities

In this section we will look at those requirements that the using MLRS battalion or battery has in the resupply

process. We have laid out the resupply system within the theater of operations, however, we have not shown what must take place in order to pick up the ammunition and deliver it to the firing units. In order to explain the required procedures, there are several terms that must be defined. They are:(7:5-7)

a. Basic load. That quantity of ammunition the theater commander authorizes for wartime purposes and required to be designated for and carried into combat by a unit. The basic load provides the unit sufficient ammunition to sustain itself in combat until the unit can be resupplied. The basic load is managed by the unit and includes, but is not necessarily limited to, ammunition carried by the individual soldier, stored in crew vehicles, carried on prime movers and in the unit trains. The basic load is expressed in rounds, units or units of weight as appropriate.

b. Expenditure. This is the amount of ammunition used by a unit. During combat, ammunition is considered expended when it's issued to the user by the ASP or in the case of ATPs, the ammunition is considered expended when it leaves the CSA or ASP for the ATP.

c. Required Supply Rate (RSR). The required supply rate is the estimate of the amount of ammunition needed to sustain operations for a combat force, without restrictions, for a specific length of time. It is expressed in terms of rounds per weapon per day for ammunition items fired from

weapons. The tactical commander uses the RSR to state ammunition requirements. This is reported to the next higher headquarters as part of the periodic operations or logistics reports.

d. Controlled Supply Rate (CSR). This is the rate of ammunition use that can be sustained with available supplies. The CSR for weapons ammunition is expressed in rounds per unit, individual, or weapon per day. The theater commander announces the CSR for each item of ammunition. In turn, the commander of each subordinate tactical unit announces a CSR to his commanders at the next lower level. The CSRs for individual items may vary from one command to the next. The CSR could be the same as the RSR if there are no restrictions as mentioned previously. A unit may not draw ammunition in excess of its CSR without authority from its next higher headquarters. (1:11-9,10)

An MLRS unit will expend tremendous amounts of ammunition. By far the most demanded item will be MLRS rocket pods. Other items that may be required are small arms and crew served ammunition, explosives, mines, fuzes, detonators, pyrotechnics and associated items. To be an effective combat multiplier, the MLRS commander and his staff must keep the unit adequately supplied through a realistic and aggressive resupply plan.

The planning process must be comprehensive, and

extensive coordination between operations and logistics channels is required. The result of proper planning is the timely arrival of ammunition in the types and quantities required. Ammunition, for future combat operations must be forecasted based on published planning factors and the commander's intent. The ammunition planner must understand the unit's initial issue (basic load) and ammunition resupply capability within the MLRS battery.(1:11-10)

The logistical officer (battalion S4/MLRS battery commander) plans for all ammunition operations. The battalion operations officer (S3), battery commanders and the ammunition officer must continually coordinate and exchange information concerning ammunition. Each must understand basic loads and RSRs submitted to higher headquarters. This information is used by the battalion and battery commanders to plan resupply operations and establish delivery priorities.(1:11-11)

4.6 Battalion Operations

The MLRS battalion indirectly controls battery resupply through the fire direction center (FDC) fire mission processing. The divisional MLRS battery works under the same principle except the division artillery tactical fire direction system (TACFIRE) is the usual controlling FDC. The requirement to have ammunition available to meet the mission needs is the overriding logistical consideration. The MLRS battalion commander will face situations where he may need

to centralize his ammunition assets in order to best support his firing batteries. Ideally, as the MLRS battery is the primary unit of tactical employment, singular battery ammunition management would warrant the first consideration. Although not doctrine, the battalion commander could direct anywhere from four to six HEMTTs/HEMATs from each battery to be consolidated at the battalion level unit trains. This would provide a total of 12-18 resupply vehicles (RSV).(1:11-11) Based on the needs of each battery, the commander could then dispatch the necessary vehicles to them for resupply. The consolidation option will also allow the battalion commander to take HEMTTs/HEMATs not being utilized in some batteries and use them to assist in the resupply of fully committed batteries.

Resupply vehicles will normally pickup ammunition from one of two places: the division operated ATP or the corps operated ASP. Once again, divisional MLRS batteries will be supported from a designated ATP, however if their needs cannot be met by the ATP, the battery will be forced to return to the nearest corps ASP for resupply. The MLRS battalion will generally be supported from an ASP.

4.7 Battery Ammunition Operations

Each MLRS firing battery has an ammunition platoon that can provide ammunition support to the three firing platoons simultaneously. The ammunition platoon is supervised by a

platoon leader and a platoon sergeant. Normally, the ammunition platoon headquarters is located at the logistic operations center (LOC) in the battery headquarters. From this area, either the platoon leader or platoon sergeant plans and controls ammunition resupply operations. The documentation required for ammunition issue at the supporting ATP is prepared at the LOC.(1:11-13)

The platoon has 18 heavy expanded mobility tactical trucks (HEMTT) and 18 heavy expanded mobility ammunition trailers (HEMAT). A six vehicle ammunition section, under the supervision of the ammunition section chief, supports each firing platoon. The composition of this section may be tailored by the platoon leader on the basis of the current tactical situation and the commander's guidance. During normal operations, the platoon leader may keep two to three resupply vehicles within the battery headquarters under LOC control. The remaining resupply vehicles are usually placed under the operational control of each firing platoon. The tactical situation and location of the ATPs may make it desirable either to place all vehicles in one consolidated ammunition supply area controlled by the battery or to disperse all ammunition sections to the firing platoons. There may be times when a combination of methods will provide the best possible fire support. The coordination, communications systems, and control of the ammunition sections must be completely understood by all battery

personnel. A resupply vehicle must not be allowed to leave the battery or platoon area without first checking with the appropriate headquarters element. Vehicle status must be continually reported. During convoys, the convoy commander should operate on the battery admin/log net. Because of the large number of personnel using the net, the other vehicle drivers should only monitor.(1:11-14)

The battery fire direction center (FDC) specifies the number of launch pod/containers (LP/C) that should be sent to each platoon area. A planned time of arrival also is determined. It is the operations officer who determines the firing platoon ammunition resupply requirements. The ammunition platoon headquarters dispatches the appropriate number of vehicles to the firing platoons or to the ATP. Upon return to the ammunition platoon headquarters, the vehicles are placed in a covered and concealed position. In conjunction with fire mission cycles, the platoon leader directs HEMTTs to move to designated reload points. The launcher drops its empty LP/C at or near the reload point and rearms.(1:11-14)

As the HEMTT/HEMATs are emptied, their status is reported to the controlling firing platoon headquarters, which releases them to the ammunition platoon leader who will form convoys for dispatch to the supporting ATP. Once dispatched, the convoy proceeds to the ATP where on board MHE

is used to load the vehicles. When loaded, the convoy returns to the battery headquarters or directly to the firing platoon. (1:11-15)

4.8 Aerial Resupply

Because of the tremendous rates of fire of the MLRS and the weight and cube of the LP/C, the transportation requirements to move the required ammunition all the way from the port to the firing batteries will be astronomical. Competition for these surface transportation assets by other classes of supply could and probably would result in some shortfalls. If the rate of fire is heavy and the resupply time is lengthened, a unit could find itself critically low or even temporarily out of ammunition. Thus, the use of aerial resupply by helicopter and fixed wing aircraft when available, could provide very rapid resupply to the unit.

There are two significant problems with aerial resupply, the size and weight of the LP/C. One LP/C weighs 5200 pounds and has the following dimensions: (8:1)

a. height-33 inches

b. width-42 inches

c. length-166 inches

The CH-47D helicopter has the capacity to carry 25,000 pounds of cargo. Thus, simple mathematics would indicate that four LP/Cs is the maximum load possible. Fortunately the internal dimensions of the CH-47D will accept four LP/Cs. Presently, the only tests conducted involving the loading of

four LP/Cs was by the internal method. Tests have been conducted on sling loading one LP/C and it proved successful, however, more work must be done on the rigging techniques in order to stabilize the external load.(8:7) Once developed, because of the time and equipment required to load and unload the helicopter, the sling loaded method will be preferred. Sling loaded cargo can be delivered and dropped quickly thus allowing the helicopter to return without unnecessary delay. Movement of LP/Cs by air is feasible and should be pursued as an alternative to ground transport. Availability of aircraft will always be scarce, but given the limited ground assets in the Corps Support Command to move LP/Cs up to the distributing points and the ever changing battlefield situation, aerial resupply must be utilized to augment ground whenever possible.

4.9 Emerging Doctrine

The Army has been doing some indepth analysis of the ammunition distribution system and has determined that there are deficiencies that could effect the ability to provide the desired level of support for the AirLand Battlefield. Therefore, a new concept has emerged and is presently being staffed with the Major Commands. The new concept is called the Maneuver Oriented Ammunition Distribution System (MOADS). MOADS' primary objective is to provide 100 percent of the ammunition required through the ATPs to supported divisional

and corps units. To accomplish this goal, high usage, high tonnage munitions will be delivered in combat configured loads (CCL) to ATPs in the brigade and division support areas. Low usage, low tonnage munitions will be shipped to the ATPs with multiple types of ammunition (5-20 Department of Defense Identification Codes (DODICs) or more) per trailer. (6:1) This will prevent units from returning all the way back to the ASP to pick up the low usage, low tonnage items such as small arms, hand grenades and mines.

CCLs are predesigned loads of ammunition designated for certain combat units. Based on forecasted needs and update changes to those needs, the CSA ships, via corps transportation assets, CCLs to the ATPs in the division sector. CCLs are assembled to the nearest unit pack, and available in limited types for armor, infantry, artillery, engineer, air defense artillery and aviations units. When combining the number of CCLs issued from the CSA and ASPs, 90 percent of the ATPs requirement is in the form of CCLs, the remaining 10 percent is single-DODIC or in other words, separate line items. CCLs are also issued from the ASPs in the same manner as from the CSAs. The ASP issues 25 percent of the ATP requirements using corps transportation assets. Of this 25 percent, 60 percent is issued in the form of CCLs and 40 percent is single line items.(6:3) The primary advantage of the CCL is the reduction of handling required at the ATP. CCLs allow the ATP personnel to segregate the

trailer loads by types of units. When an artillery unit comes for resupply, it will report to only one location where all of its needs will be filled. Under current doctrine it may have to stop at several points within the ATP. CCLs basically allow the using unit to transfer ammunition from one trailer to another. In the case of the MLRS unit LP/Cs can be transloaded using organic lift capability on the HEMTT.

MOADS will increase the number of ASPs per division from 2 to 3. These ASPs, which are smaller than the current ASPs, will store 1-3 days of supply and will be located in the division rear when the tactical situation and terrain permits.(6:1) Going from 2 to 3 ASPs allow stocks to be better dispersed thus reducing the enemy's ability to disrupt operations. The ATP located in the division support area and currently operated by the division's Main Support Battalion would come under the operation of the Direct Support Ammunition Company of the corps. In theory this will increase the capability of the ATP to augment the three forward ATPs while also providing support to corps units in the division's area of operation.(6:4) Some divisional and corps units may find themselves in closer proximity to an ASP than an ATP and therefore, could receive their support from the ASP.

Corps transportation (ground and air) will be allocated

and operated in a direct support role to support ammunition shipments from Corps Storage Areas to ASPs and ATPs, and from the ASPs to the ATPs. Close coordination and synchronization of efforts between ammunition and transportation units is critical to the successful operation of MOADS and the delivery of 100 per cent of user requirements through the ATPs. (6:1)

The MOADS concept will provide MLRS and aviation ammunition to a designated ATP. The understanding at this point in time is that the 4th ATP in the DSA would most probably be the one selected because of its central location. It is possible that the MLRS Battery organic to the division could be resupplied from one of the forward ATPs. Because of the size and the large number of LP/Cs needed by the MLRS, there are doubts as to the capability of the forward ATPs to support any MLRS unit larger than a battery. MOADS, in concept, will reduce the MLRS units resupply distance, however, the unit still must return to the DSA for resupply versus the BSA where the forward ATPs are located.

Looking over the MOADS concept it is obvious that a great deal of thought has gone into its development. MOADS is definitely a significant improvement over the current program. If a unit in combat can be 100 per cent resupplied from the ATPs then valuable turn-around time will be saved. The CCLs will also reduce the labor intensive handling in the brigade trains areas. The splitting up of the two ASPs into

three smaller ones will vastly reduce their signature as well as disperse the assets on the ground and reduce their vulnerability to enemy action. All of the improvements will serve to substantially upgrade the ability to provide ammunition where and when it is needed.

CHAPTER V

ANALYSIS

5.1 General

While the present system in operation today is effective, it is not as efficient as it could be. True, it does provide ammunition from the port facility to the using unit, but there are several potential problems in the system that could prevent the MLRS battalion and batteries from accomplishing their wartime missions. To better explain these deficiencies, we will look at a typical wartime mix of units which will allow us to examine the ammunition requirements placed on the corps ASP and the ATPs in the brigade and division support areas. This data will be derived from the expenditure rates as listed in Field Manual 101-10-1, The Staff Officers' Field Manual of Organizational Technical and Logistical Data. In particular we will examine the ammunition expenditure rates for a defensive operation, which places the greater demand on the resupply system. The expenditure rates, although developed in 1985, are still used for planning purposes today.

After examining these expenditures, we will draw some conclusions on the system's ability to provide the required resupply. These conclusions will be based on a test

conducted by LB&M Associates in 1987 in which they evaluated the resupply system within the Army division between the ASP, the ATPs and the user artillery battalion. It must be noted that although our primary focus is on the resupply of MLRS ammunition, we must also look at the total requirements for all types of ammunition because all units will be resupplied through the same ASPs and ATPs. Therefore, based on the limitations of the operators at these various resupply points, the ability to resupply the MLRS units in the corps and division could be affected.

5.2 Simulation Analysis

To analyze a typical defensive operation, we chose an Armored Division consisting of those major units listed in figure 5-1. The analysis examined the requirements generated over a four day period. The four day defensive period was chosen because the initial battles are generally the most intensive, thus placing greater demands on the ammunition system. Planning estimates show that after four days the battle becomes a protracted engagement and the expenditure rates tend to be reduced.

There were no constraints imposed on ammunition requirements. In this scenario the controlled supply rate equalled the required supply rate. Figure 5-2 shows the number of rounds per weapon fired on the first day and each of the three succeeding days of the war. Through mathematical calculations the rounds per weapon per day were

translated into the total short tonnage requirements by the division. In addition to the division organic artillery support, we allocated three 8 inch battalions and one MLRS battalion from the corps artillery assets. The corps artillery augmentation listed is the standard for a divisional operation. It should be noted that in analyzing the MLRS ammunition requirement that all ammunition passing through the ATPs was examined since the ATP is the only source of ammunition within the division zone. Thus, the time and effort required to receive, store and issue tank rounds, for instance will detract somewhat from the ability to handle MLRS ammunition.

As shown in figure 5-3, the first days ammunition requirement for the total force was 4,866.8 short tons (ST). Taking out the corps artillery units' requirements of 2,148.9 short tons leaves a division requirement of 2,717.9 short tons. Under the current ammunition system this exceeds the combined ATPs capacity of 2,000 ST per day by 717.9 ST. Therefore, if the remainder is to be obtained, divisional units must return to the nearest ASP, which adds 2-4 hours to the turn around time of the resupply vehicles of the combat unit. While it is possible to exceed the 500 ST per ATP capacity for a limited amount of time, according to the LB&M test, the ATPs were only able to issue 530 ST per day which was determined to be its 4-7 day surge capacity. (9:8) This

model used 500 ST as the issue capacity of each ATP due to the limited handling requirements.

As previously stated, all corps elements such as field artillery units get resupplied from the ASPs. Looking at the two ASPs backing up the division, we know that they each have a rated capacity of handling 1,100 ST per day equalling 2,200 total short tons. One should remember that the each ASPs cannot both receive 1,100 ST and issue 1,100 ST in a days time. 1,100 ST is the total capability. Therefore, assuming that the TSAs and CSAs will be constantly resupplying the ASPs we used a model of 50 percent receipts and 50 percent issue for each ASP. Thus, the issue capacity of each ASP equates to 550 ST per day. The corps artillery's requirement for the 8 inch field artillery battalion and the MLRS battalion which support the division equated to 2,148.9 ST, which alone exceeds the two ASPs' capability by 1048.9 ST. One should be reminded that the ASPs also provide 20 percent of the daily requirement. Therefore, subtracting this figure out of the ASPs daily lift capability leaves each ASP with the capability to issue/lift only 440 ST each (880 ST total) to the Field Artillery units in the model. Now we see a total shortfall of 1268.9 ST per day. In addition, many other units operating in the corps area will also be drawing ammunition from the ASPs, thus compounding the shortfall problem.

Looking at the succeeding days where the total

requirements decrease slightly to 4,062.8 short tons per day we see a daily shortfall of 1182.8 short tons. Once again this figure was derived by subtracting the total daily issue capability of the ASPs and ATPs. Taking this daily shortfall for the remaining three days of the operation and adding it to the already existing shortfall of 1986.8 ST incurred on the first day, we have a cumulative decrement of 5535.2 ST over the 4 day period. Thus, one may conclude that the existing system for ammunition resupply is not capable of providing the required amounts of ammunition to sustain a divisional force in the defense without significantly upgrading the capabilities of the ATPs and ASPs.

Shown also in figure 5-3 are the figures for the same force involved in an offensive operation. As noted the requirements are less than those for the defense, however, the overall quantity exceeds the capability of the ATPs and ASPs.

5.3 Factors

In addition to the ASP/ATP resupply capability, there are other factors that impact on their ability to support the force. They are:

a. The vulnerability of the supply point to enemy targeting.

b. The ability to displace depending on the flow of battle.

c. The turn around time for vehicles.

d. Ability of the transportation system to provide the daily requirements.

Vulnerability. Threat forces will make a concerted effort to locate and destroy ammunition storage sites and operations to degrade US combat capabilities and effectiveness. Threat forces include: conventional, unconventional and special purpose forces, air mobile and airborne units, aircraft, rocket and artillery forces. These forces vary in size from three man teams to an operational maneuver group with weapons ranging from a rifle to tactical nuclear missiles. To improve survivability, the ammunition distribution system must be designed so a non-nuclear attack on one or several sites does not produce catastrophic loses to the theater or corps.(6:1-2)

Displacement. Because of the great probability of attacks on the ATPs, it is mandatory that these organizations relocate rather frequently. This is a very difficult task to accomplish in that it requires extensive coordination with the combat units as to when one supply point will close down, and when and where the new one will be operational. While the coordination just mentioned is extremely difficult, perhaps the greatest problem is the actual movement of ammunition stocks. The ammunition sections of the Supply Company of the Forward and Main Support Battalions have insufficient transportation assets to move the uploaded ammunition. Therefore, assistance from the corps

transportation units must be obtained. Although ammunition is the number one priority for wartime transportation assets, one must realize that there is only a fixed quantity within the corps. Taking into consideration the numerous competing requirements for these scarce assets, travel time, set up and tear down time, one can see the possibility of not being able to move the ATP supplies to a new location and become operational very quickly. The picture is even more complicated if required to move more than once per day.

Turn around time. Turn around time is the time it takes for resupply vehicles to drive to the ATP or ASP, load and return to the firing element. In order to prevent a shortfall of ammunition in the forward area, the turn around time should be no more than 4 to 4 1/2 hours. If the time is extended beyond 4 1/2 hours as has been the case in many field operations, the ability of the firing batteries to put ordnance on the target is significantly reduced. Such problems as lack of MHE, personnel fatigue, difficulty in locating the ATP or ASP, improper layout of the area or just plain length of the queue waiting to be served can have a dramatic effect on time. If the ATP does not have the type and quantity of ammunition needed, the unit will be required to return to the ASP which is 30km further to the rear, thus adding more time to the process.

Transportation Requirement. The current system and the proposed MOADS system indicate that the ASPs and ATPs have

the capability to handle fixed amounts of ammunition per day. This is based on the throughput of 80 percent of the ATPs' requirement from the CSA under the current system, and 75 percent under the MOADS concept. ASPs will be resupplied from the TSAs and CSAs. The common denominator in this entire operation is the availability of corps transportation assets, primarily trucks. These assets are in great demand for a multitude of purposes, therefore, extensive planning, coordination must be conducted in order to have the required vehicles at the right time and place. This is no easy accomplishment. Research has indicated that 100 percent of the total requirements for transportation assets cannot be met by the Army, therefore, a high reliance has been placed on the use of host nation support. While this is a source of help, it is almost impossible to determine what assets will be made available to US forces. Therefore, one cannot rely heavily on the hope that host nation support will be readily available when called.

All these factors compound the problems of an already questionable supply system. These factors only add to the fog and friction associated with combat of this magnitude.

5.4 Conclusion

This paper looked at the Multiple Launch Rocket System, the most modern fire support weapon system on the battlefield

today. With each of the 27 launchers in a battalion having the capability of firing 12 rockets in less than 60 seconds, it is easy to see that the MLRS will put a tremendous burden on the ammunition resupply system. This high rate of fire combined with the problems associated with the size and weight of the LP/Cs make this system a true challenge to be resupplied.

The divisional simulation model which incorporated the standard Army planning factors indicated that the current resupply structure is inadequate to meet the needs of today's battlefield. The divisional slice, which included the augmentation of three 8 inch Field Artillery battalions and a MLRS battalion faced a significant daily shortfall of ammunition. The ATPs did not have the lift capability to transfer ammunition to the combat units even with the non-divisional units returning to the ASPs for their ammunition. Likewise, the ASPs were unable to issue the quantities of ammunition required by the Corps units. What was not pointed out, was the additional shortfall at the ASPs to supply the many Corps units that have no direct relations to the division but must be resupplied by the ASPs. This problem is further magnified by the fact that each corps will be composed of from three to five divisions. Current doctrine requires divisional units to also return to the ASP if they cannot get the required ammunition at the ATPs. The simulation pointed out that even if the divisional units

returned to the ASPs, the ASPs did not have the capability to issue the items.

While the MOADS concept is a step in the right direction, there are some concerns as to whether certain improvements can be realized. It is questionable that the Direct Support Ammunition Company can efficiently staff and operate three ASPs and one ATP on a sustained basis. As mentioned earlier, this company only has the capability to operate one ASP in its standard configuration and two when augmented. Realizing that the three ASPs will each be smaller than those currently in existance, one must question how the personnel and equipment will be broken out or stretched to cover all the bases. Who will provide the leadership at each site and how will they be able to defend themselves against rear area operations? In order to concurrently operate the four sites listed, significant changes must take place in the unit's Table of Organization and Equipment (TO&E). It is difficult to imagine what personnel will be available to work after security and other details are taken out.

MOADS does not specifically address the already existing transportation shortfall in the corps. The concept calls for a corps slice of transportation assets to be used in a direct support role to haul ammunition from the CSAs to the ASPs and ATPs. The Transportation Medium Truck Company

is the primary unit designated for this mission. In order to meet the ammunition haul requirements of the notional division outlined in the simulation for day one of the battle (4866.8 ST), it would require 324 stake and platform (S&P) trailer loads based on an average hauling weight of 15 tons per trailer. With each 5 ton tractor making two trips per day, when considering 75 percent of the fleet operational, a total of 162 tractors or 3.6 companies would be required. For a minimum of three division Corps a total of 10.8 companies would be required. This analysis only looked at the weight restrictions. The LP/C of the MLRS presents another problem which is cube size. A stake and platform trailer can haul five LP/Cs with 4000 pounds left over when considering only the weight restriction. When considering cubic hauling capacity, only four LP/Cs could be transported by one S&P trailer.

The analysis conducted by an independent research activity, LB&M Associates, determined that the ATPs can improve their handling ability by working extended hours, however, at no time did they improved more than 30 short tons per day. The test also concluded that this surge rate could not be maintained over an extended period of time due to the fatigue factor of the soldiers operating the ATPs. The same principle will hold true for the ASPs.

Under the MOADS concept, all MLRS ammunition will be issued out of one designated ATP to divisional and Corps

units operating within a division's area of operation. It appears that while this will certainly facilitate the distribution of LP/Cs to the forward deployed units, it will tend to counter the attempt to reduce the signature and vulnerability of supplies to enemy hostile action. As shown in the simulation, 628.4 ST of MLRS ammunition are required on day one and 502.8 ST for each day thereafter. The 628.4 ST equates to 242 LP/Cs. Realizing that there would probably not be 242 LP/Cs at the ATP at any one time, it is reasonable to believe that there would be a sizeable quantity on hand which would make concealment as well as dispersion quite difficult. Remembering that all ammunition at the ATPs is trailer mounted and that only 4 LP/Cs will fit on a standard 22 1/2 ton S&P trailer. Mathematics will show that 242 LP/Cs equate to 60.5 trailers. Even 100 LP/Cs would require 25 trailers. There is no doubt that combining the MLRS ammunition with other required ammunition at that particular ATP will certainly provide a lucrative target. An additional vulnerability is the fact that should the enemy situation require that ATP to displace, the division would find it very difficult to move it in a short period of time.

The purpose of this paper was not to develop a new system for resupply of ammunition in a theater of operations. However, after studying the current as well as the emerging doctrine, it is difficult to see how the combat units will be

resupplied in sufficient time to win the first as well as succeeding battles. The simulation pointed out that current force structure cannot provide the receipt, storage and issue capabilities required at the ASPs and ATPs even if there is in fact enough ammunition in the theater to support the divisions' needs. Also figured into the equation was the fact that the ATP would issue its maximum handling capability of 2000 ST per day. In reality the ATPs would probably not issue 2000 ST per day due to requirements for receiving incoming deliveries, administrative paperwork and guard details. One should not lose sight of the fact that users will not arrive at the ATPs on an evenly scheduled basis, thus making an uneven work flow which could affect the output of the ASPs and ATPs. Although ammunition units will be working around the clock, due to possible enemy activity, especially enemy air or airmobile operations, nightime operations will be conducted under blackout conditions which will even further degrade capability. Another factor included in the 2000 ST is the fact that all material handling equipment is operational. This does not happen in peacetime and, for sure, could not be expected to happen in war.

In order to ascertain whether the proposed MOADS system will sufficiently improve the ability to resupply the combat units and in particular the MLRS units several events should be considered:

1. A large scale computer simulation should be conducted using anticipated consumption rates and wartime factors such as attrition of equipment and people, regularly scheduled security and work details, maintenance downtime, night time operating conditions, rear area combat operations by the enemy, disruption of supply lines and the requirement to displace periodically.

2. Analyze the force structure using the new PROLOGUE system at the Logistics Evaluation Activity to help determine requirements to support the operation.

3. Consider the possibility of issuing MLRS LP/Cs from each ATP. This will reduce the vulnerability to enemy action as well as move the ammunition closer to the firing batteries. There appears to be no significant retooling required to make this happen.

4. Consider authorizing each Field Artillery Brigade its own organic support battalion. If the present force structure limitation will not allow this addition then at least evaluate the possibility of adding an ATP capability to the brigade. Artillery has always been the greatest consumer of ammunition in wartime, it only makes sense that they should have more capability to support themselves.

5. A large scale realistic exercise should be considered in order to test the system. The test should involve an established corps with only its organic support

assets. The test should involve the theater CINC and should not only test the ability to resupply the ATPs and ASPs, but should also test the ability to move amunition from the port to the TSAs and CSAs. Only the authorized equipment hauling the actual ammunition over the required distances under wartime conditions will give a true appraisal of the system.

The Multiple Launch Rocket System provides that extra punch needed to support a force that must fight an enemy whose forces greatly outnumber ours. Its greater range and increased firepower will allow our forces to attack the Soviets at a greater range with an increased lethality. The MLRS also brings with it a greater appetite for ammunition than other systems. If it is to be effective it must be supported by a responsive ammunition supply system. The current system does not measure up. Whether MOADS can meet the challenge remains to be seen.

SCENARIO FORCE

Unit type	1st BDE	2d BDE	3d BDE	Div Rear
Avn Bde				1
Armor Bn	2	2	3	
Mech Bn	2	2	2	
FA Bn (155mm)	1	1	1	
FA Bn (8")(NonDiv)			1	2
MLRS Bn (NonDiv)				1
MLRS Btry			1	
ADA Bn				1
ADA Btry	1	1	1	
ENG Bn	1	1		
ENG Co	1	1	1	6

Figure 5-1. Units

ROUNDS PER WEAPON

BY TYPE OPERATION

Type Ops	155	8"	MLRS	M1
Defense				
a. 1st day	203	177	40	78
b. succeeding days	207	164	32	47
Offense				
a. 1st day	146	161	31	65
b. succeeding days	153	158	24	35

Figure 5-2. Required Supply Rate

RSR

SHORT TONS PER DAY

	1st Day	Succeeding Days
Defense		
155	991.7	1011.2
8"	1677.6	1548.0
MLRS	628.4	502.8
M1	977.2	588.8
Div(-)	591.9	412.0
Total	4866.8	4062.8
Offense		
155	713.2	747.4
8"	1519.2	1490.4
MLRS	365.1	282.9
M1	814.3	438.5
Div(-)	622.4	404.4
Total	4034.2	3363.6

Figure 5-3. RSR Short Ton Requirement

LIST OF REFERENCES

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2. US ARMY Field Circular 6-20, PRINCIPLES OF FIRE SUPPORT, Washington DC: Government Printing Office, 1987.

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4. US ARMY Field Manual 100-5, OPERATIONS, Washington DC: Government Printing Office, 1986

5. US ARMY Field Manual 9-6, Ammunition Service in the Theater of Operations, Washington DC: Government Printing Office, 1984.

6. US Army Logistical Center Memorandum, "Subject Revision of US Army Ammunition Resupply Procedures", Fort Lee, Va, 1987.

7. US ARMY Field Manual 100-10, Combat Service Support, Washington DC: Government Printing Office, 1983.

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GLOSSARY

ASP	Ammunition Supply Point
ATP	Ammunition Transfer Point
BSA	Brigade Support Area
C3	Command, Control and Communication
CCL	Combat Configured Load
CINC	Commander in Chief
CONUS	Continental United States
COSCOM	Corps Support Command
CSA	Corps Support Area
CSR	Controlled Supply Rate
DODIC	Department of Defense Identification Code
DS	Direct Support
DSA	Division Support Area
FA	Field Artillery
FDC	Fire Direction Center
FEBA	Forward Edge of Battle Area
FLOT	Forward Line of Own Troops
FSB	Forward Support Battalion
GS	General Support
GSR	General Support Reinforcing
HEMAT	Heavy Expanded Ammunition Trailer
HEMTT	Heavy Expanded Mobility Truck
LOC	Logistics Operation Center
LP/C	Launch Pod/Container

MBA	Main Battle Area
MHE	Material Handling Equipment
MOADS	Maneuver Oriented Ammunition Distribution System
MLRS	Multiple Launch Rocket System
MSB	Main Support Battalion
OMG	Operational Maneuver Group
R	Reinforcing
RSR	Required Supply Rate
S&P	Stake and Platform
S&S	Supply and Services
TACFIRE	Tactical Fire Direction System
TDA	Table of Distribution and Allowances
TOE	Table of Authorization and Equipment
TSA	Theater Support Area